

Utilization of Blood and its components in tertiary care Hospital of Eastern India**Shailesh Kumar¹, Vidyut Prakash^{1*}, Rakesh Kumar¹, Ashok Kumar Raut¹, Kamlesh Rajpal¹, Reecha Singh², S.K. Shahi¹**¹ Department of Microbiology, IGIMS Patna-14² Department of Pathology, IGIMS Patna-14

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Abstract

Background: Blood is an important sterile body fluid, which is essential for human survival. Transfusion of blood and blood components is an integral part of health care practice. Injudicious use of blood and its products among patients causes unnecessary burden to patients as well to the blood bank. **Objectives:** The aim of this study is to evaluate the utilization of blood and blood components by various departments in a tertiary care hospital. **Materials and Methods:** We carried out a cross-sectional study on patients requiring transfusion of blood and its components from January 2018 to December 2018. Data was retrieved from monthly collection register and utilization of blood and blood components was taken from the requisition forms and blood issue registers. **Results:** Total whole blood units collection was 16439. A total of 20088 units were utilized which included whole blood and blood components. Whole blood was the most utilized product followed by Packed red blood cells (PRBC), platelet concentrates and the least utilized product was fresh frozen plasma (FFP). Regional cancer centre (RCC) wards utilized maximum 17.8% of total issued whole blood and blood component units followed by Emergency/Trauma department. **Conclusion:** Formulation of strict guidelines for transfusion practices will improve the appropriate use of blood and its products. Periodic evaluation of utilization pattern by various departments and demand for different blood products also helps to maintain the bloodstock. It is important to create awareness among clinicians regarding advantages of component therapy over whole blood transfusion

Keywords: Whole blood, blood components, PRBC; FFP; Platelets concentrate

Introduction

Blood is an important sterile body fluid and performs a vital function essential for human survival. It is responsible for the transportation of essential substances to the cells of the body and removes waste metabolic products away from these same cells. Blood transfusion was first performed successfully by James Blundell in 1818[1]. Transfusion of donated blood is the mainstay of treatment in a variety of medical/clinical conditions. Indication of blood transfusion includes various conditions like severe anaemia, bleeding disorders, blood loss during surgery or trauma and others[2].

Blood component therapy has gained much interest, due to many advantages over whole blood transfusion in terms of greater shelf life of some blood components, less chance of volume overload in patients and better patient management[3]. Blood component therapy is indicated when the expected benefit to the recipients has outweighed the potential risks. Decision to transfuse blood components should be based on the clinical status of the patient and his or her response to any previous transfusion as well as laboratory parameters[4]. Proper inventory management is an important factor to ensure appropriate utilization and decrease wastage of precious resources. Inventory management includes all activities associated with ordering, storing, handling and issuing of blood products[5]. Despite advancements in the field of transfusion medicine, there is still more utilization of whole blood and under utilization of blood components. We undertook this study to determine the

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utilization of blood and blood components in various departments.

Material and Methods

This cross-sectional study was carried out in Blood bank of a tertiary care hospital of Patna, Bihar. Ethical clearance was obtained from the Institute ethical committee. Duration of study was over a period of 1 year from January to December 2018. We collected data of monthly collection and utilization of blood and blood components from the requisition forms and blood issue registers. We also obtained data of the utilization of blood and its products from various surgical department like surgery, orthopaedics, ENT and gynaecological specialties and non-surgical specialties like medicine including cardiology, neurology and nephrology. A total of 13339 units of whole blood and 6749 units of blood components were issued to various departments of the hospital during the study period.

Results

In this study, over a period of one year 16,439 units of whole blood were collected, which includes 14906 units from male donors and 1533 unit from female donors. Of the collected whole blood, 239 (1.45%) units were discarded due to transfusion-transmitted

infections. A total of 13339 units of whole blood were utilized during this period. A total of 9429 units of components were prepared during this period and 6749 units of components were utilized. [Table 1] Among prepared components all PRBC were utilized, followed by 80% platelet concentrate and 35% of FFP. If we consider all utilised units (whole blood + PRBC + Platelet concentrates + FFP = 20088 unit), 66% (13339 unit) were whole blood, 15.6% (3143 unit) were PRBC, 12.4% (2502 unit) were Platelet concentrates and about 6% (1104 unit) were FFP. [Fig-1]. Blood units were utilized mainly by regional cancer centre, which accounted for 3550 units (17.7%), followed by the department of Emergency/Trauma which received 2573 (12.8%) units. Utilization by department of nephrology was 2378 (11.8%) units. Demand from the surgical wards was 2166 (10.8%) units which were provided. In our hospital, less requirement for blood units (2%, n=401) was from the department of eye and ENT during the study period. [Table 2] In the present study, most common indication requiring blood transfusion (n=2741, 21.8%) was elective surgery, which included general surgery, gastrointestinal, cardiothoracic, urological, otolaryngology, ophthalmology, and paediatric surgery, followed by malignancies.

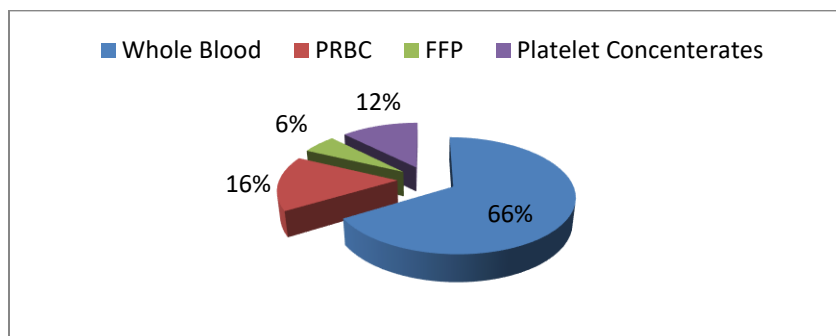


Fig 1:Percentage utilisation of whole blood and blood components

Table 1: Number of total collection, discard and issue of blood and its component units in 1 Year

Whole blood collected	16439 units
Component prepared	9429 units
Component issued	6749 units
Whole blood issued	13339 units
Discarded blood	239 units

Table 2:Utilisation of blood and its component by various departments

Departments	Whole Blood		PRBC		Platelet Concentrate		FFP		Total	
	Unit	%	Unit	%	Unit	%	Unit	%	Unit	%
RCC	2001	15%	566	18%	751	30%	232	21%	3550	17.7 %
CTVS	800	06%	220	7%	300	12%	22	02%	1342	6.8 %
Surgery	1134	8.5%	251	8%	250	10%	331	30%	1966	9.8 %
ICU	1067	08%	377	12%	276	11%	89	08%	1809	9.0 %
Emergency/Trauma	2001	15%	409	13%	75	03%	88	08%	2573	12.8 %
Obstetrics & Gynecology	800	06%	251	8%	50	02%	77	07%	1178	5.8 %
Orthopaedics	1067	08%	157	5%	--	--	--	--	1224	6.0 %
Nephrology	1800	13.5%	377	12%	--	--	--	--	2177	10.8 %
Gen Medicine	667	05%	409	13%	626	25%	77	07%	1779	8.9 %
Pediatrics	667	05%	32	01%	49	02%	55	05%	803	4.0 %
Eye & ENT	401	3%	--	--	--	--	--	--	401	2%
Other Hospital	934	07%	94	03%	126	05%	133	12%	1287	6.4 %

PRBC- Packed red blood cells, FFP- Fresh frozen plasma, RCC- Regional cancer centre, CTVS- Cardiothoracic vascular surgery, ICU- Intensive care unit

Discussion

In the modern healthcare system, blood transfusion is one of the life-saving measures, which play a significant role in different treatment practices. It may be required on an elective and emergency basis. Elective blood transfusion is required for correction of anaemia and major surgeries. Blood transfusion was done on emergency basis in certain conditions like blood loss after trauma or any surgery, antepartum and postpartum haemorrhage. Whole Blood and different blood components must be transfused under the supervision of trained health personnel under aseptic conditions. Prior to transfusion, tests must be conducted to prevent the transfusion reactions and at the same time, it should be screened for preventing transfusion transmissible diseases. Presently, with the advent of blood component usage for specific needs, better guidelines have been suggested and put to practice globally. In many hospitals now, the blood banks follow the standard practice of manufacturing different blood components from donated whole blood units and to supply only the components to the patients for different indications[5]. Transfusion of whole blood instead of blood components are recommended in certain situations like blood loss due to polytrauma, as

in road traffic accidents. Whole blood transfusion is also indicated in patients with blood loss more than 25% of total blood volume or in actively bleeding patients who have already received 4 unit of PRBC. Transfusion of whole blood, not only replenishes the blood volume and oxygen-carrying capacity, it also replenishes and prevents dilution of coagulation factors. Giving whole blood produces better replenishment of blood volume, with the introduction of foreign antigens from only one donor, hence exposing the recipient to lower immunological risk[6]. Fresh Frozen Plasma is prepared from whole blood or may be collected by apheresis. It should be frozen at an adequate temperature within the time limit to preserve the labile clotting factors[7]. Therapeutic efficacy in term of hemostasis and adverse reaction are equivalent for FFP derived from apheresis and prepared from whole blood unit[8]. FFP is a source of stable clotting factors, albumin, and immunoglobulins. FFP also contains natural inhibitors of coagulation, about 70% of the original coagulant factor VIII and other labile clotting factors at least similar in quantities[7]. Transfusion of FFP is indicated for correction of congenital and acquired deficiencies of multiple clotting factors[9]. thrombotic microangiopathies like thrombotic thrombocytopenic

purpura, haemolyticuraemic syndrome[10], HELLP (haemolytic anaemia elevated liver enzymes and low platelet count) syndrome, reconstitution of whole blood for exchange transfusion[11], hereditary angioedema due to deficiency of the esterase, in the absence of the inactivator of C1 specific plasma derivative[12].

A platelet concentrate (PC) prepared from either whole fresh blood by centrifugation or from an apheretic donation[13]. Indications of platelets transfusion includes prophylaxis and treatment of hemorrhage in patients with low platelets count or with primary or secondary functional disorders of platelets. The decision to transfuse PCs must not be based exclusively on the platelet count. The absolute indication is severe thrombocytopenia together with clinically relevant bleeding. All the other indications are more or less relative and depend on the clinical condition of the patient. The important goals of blood utilization management system are effective use of blood and its components with high quality and minimum wastage [14]. In our study, 13339 units of whole blood were utilized of a total of 20088 blood and blood component units. Joshi et al[15] also found an increased number of whole blood utilization compared to other components. In western countries, there is a decline in the usage of whole blood[16]. Anshoo et al and Venkatachalapathy and Subhashish documented the increased distribution of packed red cells among blood components which are in keeping with our findings[17,18]. Ambroise et al. showed an increased issue of FFP and Platelets in relation to PRBC, this is in contrary to our study[16]. This study showed that whole blood contributed 66.4 % of total transfusions, which was lower than that found in the study by Gupte and Shaw showing better usage of blood components in our institution[19]. *Bangal VB et al.* in their study on pattern of utilization of blood and blood components in obstetrics reported that transfusion rate in total admitted patients was 5.33% [20] which was slightly lower than our study 5.8%. Blood collection is less than the blood requirement due to less number of voluntary donors. Advanced blood bank technology and availability of blood components help in optimal utilization of scarce blood resources.

Conclusion

This study provides information about the utilisation pattern of blood and blood components in our tertiary care hospital. There is a need for creating awareness among health professionals for use of blood components thereby reducing unnecessary usage of whole blood units. Regular auditing and improved communication between the clinicians and laboratory

physicians is essential for judicious use of blood and blood components.

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